GSL Science Panel Meeting
Dec.15, 2004
Multipurpose Room in the
State Library for the Blind

Dr. William Moellmer, Chair opened the meeting.
Introduction of Science Panel Members and Stakeholders

Science Panel Attendees:
William Moellmer
Brad Marden
Anne Fairbrother
William Adams
William Wuerthele
Joseph Skorupa
Theresa Presser
Theron Miller

Facilitator: Jennifer Wicker

Richard Bay presented the duties and charges of the Science Panel. He requested in behalf of the steering committee to identify gaps and scope of work and to move forward quickly.

Mansuel Pierce with the Great Salt Lake Alliance talked to the science panel about getting good science done in an efficient and planned way that is critical in this study for the investment of monies that is being made from stakeholders.

Leland Myers addressed the science panel about the importance of including the impairment to beneficial uses in the GSL as one of the issues of the study. He commented that time doesn't drive science but science can establish time.

The discussion continued with the round robin design. A firm in Denver (ERA) will be doing the splitting of samples. ERA is a certified EPA lab that can do the splitting.

Moellmer: We are planning to have two sample locations, and triplicate samples. Should we use filtered or unfiltered samples?
Skorupa: It will be useful to have both and to check between filtered and unfiltered. I was suggesting checking between difference of total recoverable and dissolved selenium.
Adams: My concern is that when solids settle in carboy while is transported to the lab are they going to split the solids before analyzing samples to have uniformity in solids?
Moellmer: Where do we filter?
Adams: In the labs
Miller: If you use 0.45-micron filter it will take a long time. If you do the glass fiber it may take less time like two stages filtering coarser to finer.
Wuerthele: You could have two sets of samples in lab and field.

Moellmer: Should we take the samples, put them on a bus to ERA in Denver and have them filter and split samples and shipped from there to the various labs for analysis?
Dave Naftz: If you want to represent deep brine layer you need to filter on site because you may expose the anoxic layer to air and change its chemistry.
Adams: Specify acidification before spiking so to maintain the selenium in solution
Skorupa: Some of methodological details are from the purpose of the round robin. We need a clear statement of purpose. What is the purpose of the round robin?
Moellmer: For Regulator purposes we want to be able to find methodology where the concentration of selenium is appropriate.
Skorupa: Is the purpose to identify the best analytical technique or to identify the best lab? Also is the purpose to try to resolve the large variability of data that is currently available?
Moellmer: We need all of these. Certainly we need to know if our data (currently on the State database) is good or need to be removed.
Miller: Yes, we need to validate the current data we have on our computers.
Moellmer: Once we have a methodology that we are satisfied with we can assess the goodness of the available data.
Fairbrother: I think we need to have a two parts approach. First we need to identify the most suitable analytical methods and second determine which laboratory can do that.
Presser: How much volume do the lab needs?
Bill Adams: 500 ml.

All agreed to filter in the field and acidify with 4ml ultra pure nitric acid per liter.

Lynn Hutchinson: For hydride generation it is preferable to have hydrochloric acid. For ICP-MS it is preferable to use nitric acid, but most labs can handle both acids. I would suggest keeping it simple at this stage without introducing too many variables.
Wuerthele: There are two issues involved with the round robin: what are the best analytical techniques and what levels of selenium concentrations are we trying to get down to?
Presser: Need to ask labs what they prefer to have their samples preserved.
Adams: I agree that we need to get the labs engaged before we send samples
Skorupa: We need to have labs contracted before we send samples. Ask the lab what their preference is.
Fairbrother: We need to have the best method defined with the preservation technique the lab prefers.
Presser: I would add a 4th level of spiking of 0.5-1 micrograms/L to ascertain that the labs can analyze samples at very low level concentrations in high brine waters.
Miller: We want to surround the low levels and have spikes at high level as well.

Dr. Moellmer will contact the labs and discuss with them these issues.

Skorupa: I will suggest doing two things:

1. Prepare a written contract for the labs and
2. 2. Have the contract circulated among us for review before is executed;

Bill Moellmer presented the round robin design. Lab contacted are: Frontier Geosciences, USGS (Hydride, Graphite furnace and HLPC-MS), U of U (Hydride) and Kennecott (Hydride and ICP-MS).

Bill Moellmer will contact labs and e-mail info to all. We would add one more spiking level and information about the matrix.

Skorupa: We need a sampling design including details about filtering, preservation etc. I would suggest having **USGS and Kennecott to put a protocol together** for us.
Moellmer: Is that OK with Kennecott and USGS? Answered in the affirmative.

William Wuerthele presented the EPA approach to site-specific criteria
Wuerthele: The national criteria are based on two considerations:

1. Biological, and
2. Toxicological.

We hope that biology and toxicology represent a robust data set from which to derive water quality criteria. Criteria are based on water column values and not from dietary exposure. For the GSL the chronic exposure would be based on tissue concentrations. Need rather robust toxicological data within a range of taxa. Acute value is based on LC_{50} that represents a genus and ranges based on sensitivity to derive a final acute toxicity value that even though doesn't protect all the species all the time but that comes up with hypothetical genus that is protected 95% of the time. Dividing the acute value by two enable us to protect most of the species. For endangered species under the Endangered Species Act we need to look at all species.

The chronic value is deriving by the acute divide by a specific ratio. The values were developed using Kesterson and Belews Lake. The acute value is 20 microg/l and chronic was back calculated from that by dividing by 4 and came up with the 5microg/l.
In 2002 EPA proposed a tissue based criteria which addresses California concerns of a bioaccumulative substance like selenium. EPA derived a 7.9 microg/g tissue concentration. But they provided a red flag of 5.85 microg/g. Lemly argued that cold-water effect was not taken in account. For the GSL the acute value might need to be adjusted for sulfates.
To derive a site specific criteria for the GSL we need to adjust the national criteria by including data set on indigenous species, and the chemistry of the site. Ambient data is used too to adjust the criteria to healthy conditions of aquatic organisms that can be higher to those in other places. A key issue for the GSL is that whatever the tissue value is it need to be translate into a water column value. Need to evaluate against the current literature and fieldwork for the acute and chronic and adjust it for sulfate. Mixing zones need to be considered and also the question still remains: what do we consider "the Lake"?

Dr. Miller asked if tissue concentrations in adults should be used for this study.
Wuerthele: There is a debate whole body versus reproductive tissue.

Skorupa: For fish is the whole body. For birds usually we look at the reproductive effect through the eggs.

Adams presented his paper "Derivation of a Chronic Site-specific Water Quality Standard for Selenium in the Great Salt Lake, Utah, USA".
One of the issues mentioned was if the time of selenium application prior to testing green algae was sufficient for equilibration of selenium between the two media. Also if the sulfate and selenium antagonism has been looked upon for different concentrations. Somebody commented on the strength of the statistical model dependency on the data set. There was 1 data point per each station.

Marden: It is evident that there were no algal abundances measured.
Adams: Yes
Marden: There could be different exposures to Selenium depending on where the brine shrimp is located if whether be on the surface of water or in the deep brine layer. Brine shrimps go where the water takes them. What is our confidence in 1 data point per station?

Skorupa: Brine fly and *Ephedra* are more sensitive than brine shrimp. **I'll provide some data on brine fly and brine shrimp in the evaporation pond in California.**
Presser: In the study done in the SF Bay we methodically look at food web to come up with a model.

Adams will provide some data on some of the species collected from the GSL.

Skorupa gave a presentation on literature review that is relevant to wildlife protection. He mentioned that most papers showed two common stages:

1. A Toxic reference value was determined, and
2. 2. Based on a toxic reference value a water quality value was derived.

Luoma & Presser took the approach to look at every source of selenium coming in and looked at the assimilation factor for each trophic level. Other approaches described include the bio-energetic based approach and 3MMR approach.

Dr. Fairbrother told the panel that she knows of at least two more approaches that she will bring up at the next meeting.

At the next meeting Skorupa will put together a table that shows the comparison of the uncertainty vs. the types of approaches.

Moellmer: What can we do to expedite the process to quickly derive water quality standards?
Marden: There is a lot of data done locally that has not been done and not published yet. Would it be good to have some of the local experts on the GSL to come and present the data?

Fairbrother: Sure, it will help us to get a better idea of what we are trying to protect and the biology of the lake.

Skorupa: We need to come up with a conceptual model to establish what approach we need to take (e.g., Brix et al.) for the GSL and what kind of information we need or what gaps we need to fill.
Fairbrother: We need to define the boundaries of the lake and what species we are trying to protect and where they live (e.g. in the marshes) and their food sources.
Wuerthele: We need to understand the biology of the Lake to establish what we are trying to protect. The wildlife behavior is important to build the conceptual model by looking at most sensitive birds and derive some criteria that will give us confidence that indeed we are going to protect the less sensitive species as well.
Moellmer: Do we assume that migratory birds are here 100% of the time or 50% or what?
Fairbrother: We need to worry about the spring migratory birds and not much of the fall ones. Also, are we protecting the food sources such as Artemia and *Ephedra* species of the migratory birds?
Wuerthele: We don't have a target for the GSL. The purpose is to establish a target so we can regulates the loads.
Presser: Don't we need to understand the loads first to be able to establish a target value of selenium including seasonality?
Fairbrother: There are two approaches here. One that starts with the loads and the other that identifies what the acceptable level to what we are trying to protect is and derive a criteria for the loads in the water column.
Skorupa: We need to know from the experts what the feeding habits of the birds are and establish what is included in their diet such as algae, brine fly, brine shrimp etc.
Adams: We need the expert to help us answer basic questions on species, time of the year they feed in the GSL, ranging pattern, and what is their source of food.

Brad Marden suggested having Don Paul, Gary Belovsky (Notre Dame), Clay Preschon, Utah State University graduate students Josh Vest, Wayne Wurtsbaugh (USU), and Brad Marden to present the biology of the Lake.
Skorupa suggested setting up a teleconference with these experts to have a tele-workshop (Biology 101). The panel suggested bringing in the local experts and have a teleconference with Gary Belovsky since he is not local.

Moellmer: Do we agree that we are trying to protect the algae, brine shrimp and brine fly and focus on that?
Somebody suggested having the experts on the biology of the Lake to come and present their data before a decision is made on what needs to be protected.

The science panel agreed to take the following steps at the next meeting, as follow:
Have a Biology 101 of the GSL
Avian, diet, behavior, seasonal occurrences, what's known and what's not. Need to have a good idea of the sensitive species of the lake or the Achilles' hills of the lake
Expert opinion on gaps in existing data

Brad Marden will contact the Biology experts
Establish a conceptual model for this study
Skorupa will present a comparison between approaches and uncertainty related with them.

Have the draft for the protocol on the round robin with Bill Moellmer as the project manager, Lynn Hutchinson and Dave Naftz to assist with developing the protocol..

The following panel members can teleconference: Fairbrother, Presser, and Adams. **Joe Skorupa will check on that.**

Next Meeting: (2-day meeting) March 8, 2005 at 8:30 a.m. and March 9, 8:30-3:00 p.m. in Room 201, DEQ Building #2, 168 N. 1950 W., SLC, UT.